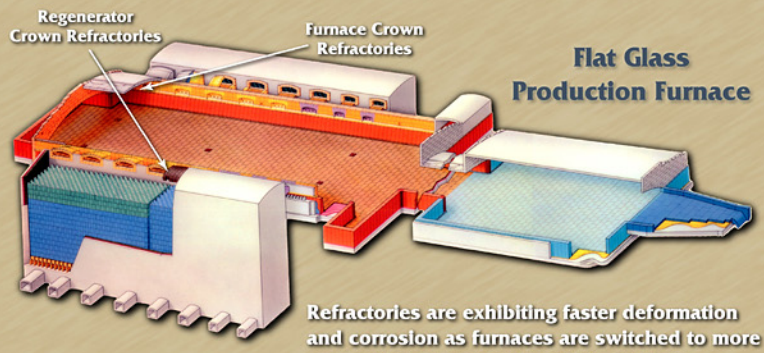
Development of Improved Refractories for the Glass Production Industry

Improved refractories will result in more efficient glass production furnaces



Flat Glass Production Furnace

Refractories are exhibiting faster deformation and corrosion as furnaces are switched to more economical and efficient oxy-fuel firing

8 Refractory Categories Will Be Tested

1. Fusion-cast alumina
2. Conventional silica
3. Fusion-cast AZS
4. Fused-grain mullite
5. Bonded AZS
6. Andalusite
7. Fused silica
8. Bonded zircon

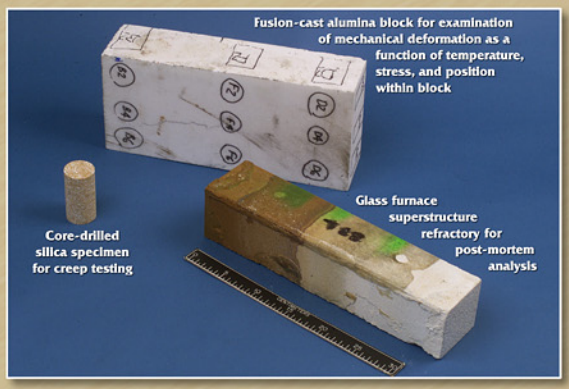
Glass Manufacturers Prioritized the Above Matrix

- AFG Industries
- Ball-FosterGlass
- Carr-Lowrey
- Corning
- Ford
- General Electric Lighting
- Guardian Industries
- Libbey
- Owens-Brockway
- Philips Lighting
- Pittsburgh Corning
- PQ Corporation
- St George Crystal
- Holophane
- Kimble Glass
- Knauf Fiber Glass
- Vetrotex
- Anchor Glass
- CardinalFG
- CertainTeed
- Corning Glass-RBMG
- GalloGlass
- Glenshaw
- Leone
- Osram Sylvania
- Owens-Corning
- Pilkington
- PPG
- Schuller International
- Techneglas
- Thomson Consumer Electronics
- Lancaster Glass
- Wheaton

Creep and Corrosion Resistant Refractories in Furnaces and Regenerators (Crowns, etc.) are Imperative for Long Furnace Life

Goals/Benefits

- Characterize the high temperature mechanical deformation, corrosion resistance, and thermal conductivity of refractories
- Greater energy efficiency and economy



Example of Refractory Characterization

Participants

- University of Missouri, Rolla
- Glass Industry Advisory Committee
  - Glass manufacturers
  - Refractory suppliers
- Oak Ridge National Laboratory (ORNL)

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Office of Industrial Technologies,
Energy Efficiency and Renewable Energy, U.S. Department of Energy

Development of Improved Refractories for the Glass Production Industry

The objective of this task is to develop improved refractions and determine critical thermomechanical and thermophysical properties of refractories in various environments.

Valid engineering creep and high temperature Modulus of Elasticity (HT- MOE) data currently do not exist for almost all commercial refractories. Yet, refractory end-users such as glass-manufacturers require such data for the more efficient and economical design of their various glass production furnace structures (e.g., crowns). With the simultaneous imposition of mechanical and thermal stresses, creep deformation of the refractory material occurs as a consequence. Designers must ensure that the structural integrity is sufficiently maintained for maximum service life, so these high temperature deformations must be understood and considered for optimum glass furnace design.

Initially the project established dedicated refractory testing facilities which are capable of generating representative engineering creep and HT-MOE data to temperatures of greater than 1700°C in ambient air. The generated engineering creep and HT-MOE data will serve R&D requirements of refractories-manufacturers and its glass-manufacturer end-users and designers. The relevance of this effort to the refractory and glass-making industries would be ensured by coordinating research activities through [1] ORNL membership with Alfred University's Center for Glass Research (CGR) Satellite Center at the University of Missouri-Rolla (UMR), and [2] the active involvement of ORNL with the OIT Refractories Working Group.

The refractory testing facilities are equipped with necessary instrumentation to accurately control and monitor refractory creep and HT-MOE tests. Two test frames are being used for this project and both are capable of conducting either creep or HT-MOE tests. High temperature test conditions will be selected that mimic those of refractory service (determined through consultation with CGR-UMR members and the OIT Refractories Working Group).

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